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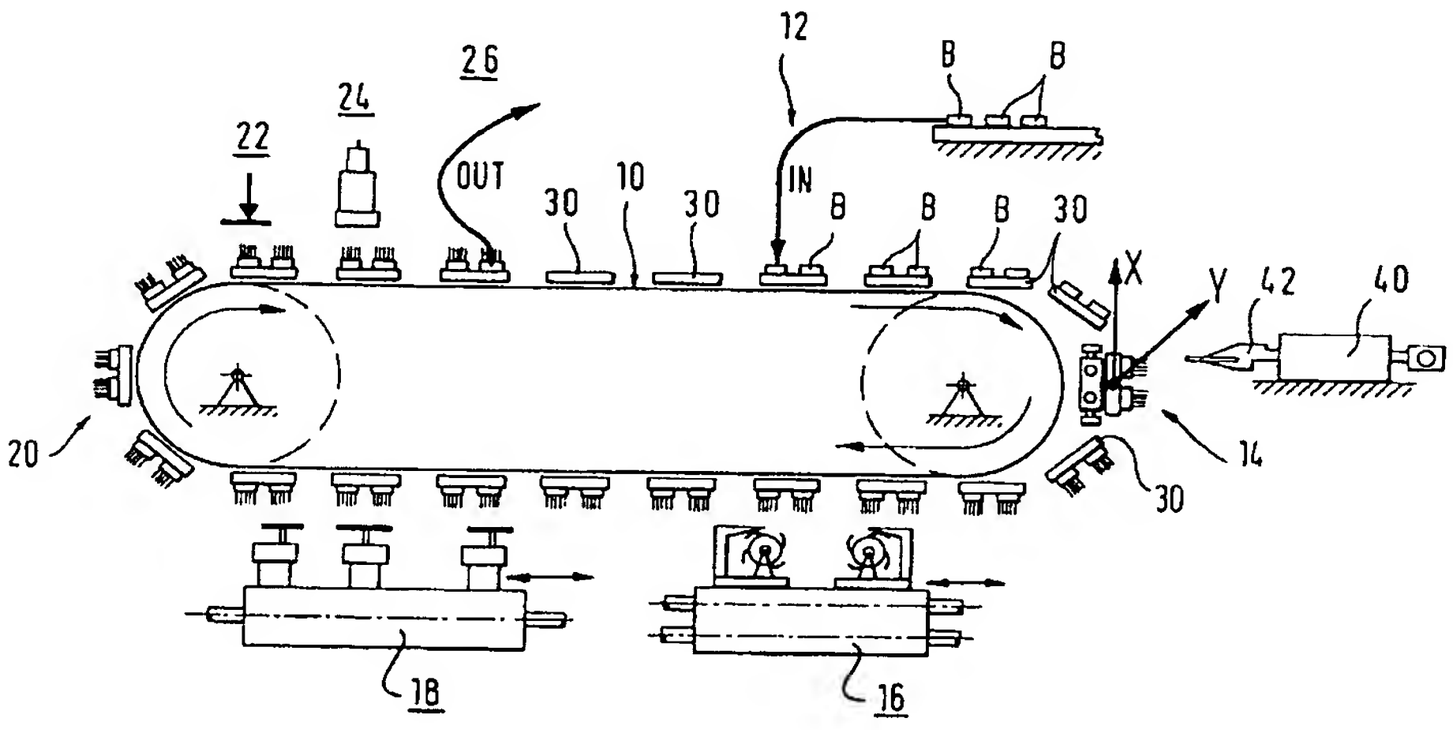
(54) Method of producing brushes.

(57) In a tooth brush procuding machine pairs of brush bodies (B) are transferred between a number of processing stations (14 to 24) while being held on individual pallets (30) which are releasably linked to a common conveyor (10) of a closed loop chain type. The filling station (14) is preceded by a supply station (12) where fresh brush bodies (B) are supplied to the pallets (30). Each pallet (30) is releasably coupled to a drive in the filling station (14) to move the pallet in a manner to successively expose each hole of the brush bodies (B) to the filling tool (40). Each pallet (30) is transferred from the conveyor (10) to a position adjacent a preceding pallet (30) in the filling station (14) during the time required for the filling tool (40) to fill the brush bodies held on the pallet (30) currently received in the filling station. Each of the pallets (30) is transferred from the filling station to the conveyor during the same time. Continuous operation of the filling tool (40) is not stopped or even slowed down during exchange of a pallet (30) with completely filled brush bodies thereon by a new pallet with fresh brush bodies.

Fig.1



EP 0 563 419 A1

The present invention relates to a method of producing brushes, in particular toothbrushes, wherein brush bodies having holes for receiving tufts of bristles are supplied to a filling station where each brush body is moved to expose each of its holes to a filling tool which implants a tuft of bristles into each of said holes, whereafter the brush bodies are transferred to a conveyor to be moved between a plurality of processing stations provided along the conveyor.

In a conventional brush making machine the filling station is provided with a turret which has two pairs of opposed faces for clamping brush bodies thereon. A brush making machine of this type is disclosed in EP 0 021 464 A1. The turret is indexed in 90° steps to present each face carrying a new brush body to the filling tool. The filling tool has a reciprocating filling member for implanting tufts of bristles into the holes of the brush body. As the filling member performs reciprocating strokes along a fixed line the turret must move in mutually perpendicular directions to expose each hole of the brush body to the filling member. During the time a brush body is processed by the filling tool, a new brush body is supplied to the adjacent upstream face of the turret. During the same time, a transfer unit comprising grippers removes a filled brush body from a downstream face of the turret to transfer the filled body to another section of the machine which has a number of brush finishing stations arranged along a common conveyor.

In modern high performance toothbrush making machines operation of the filling tool is normally not stopped or even slowed down during indexing of the turret. The filling tool may operate at some 800 or even 1000 strokes per minute so that only approximately 50 ms are available to index the turret. Thus, when the last hole of a brush body has been filled, the turret indexes and places the first hole of a new brush body in front of the filling tool within the period of a single stroke of the filling member. It is thus clear that the turret should be as small and lightweight as possible to allow high-speed operation. Nevertheless, operating speed is mainly limited by the mass of the indexing turret, and also by the requirements of supplying new brush bodies to a moving turret, so that the supply unit must move with the turret, and of removing the filled brush bodies from a moving turret, requiring the gripper of the transfer unit to follow movements of the turret.

The present invention provides a new and improved method of producing brushes, in particular tooth brushes, wherein these limitations are avoided. In the method of the present invention, a brush body supply station is provided along the conveyor of the machine upstream from the filling station and the finishing stations. The brush bodies are transferred between the supply, filling and finishing stations while being held on a carrier member. Each carrier member is releasably coupled to a drive in the filling station which moves the carrier member in a manner to successively expose each hole of the brush body to the filling tool. Each carrier member supplied with new brush bodies to be filled is transferred from the conveyor to a position adjacent a preceding carrier member currently processed in the filling station. This transfer occurs during the time required for the filling tool to fill one or two brush bodies held on the carrier member in the filling station. After the brush body or brush bodies held on the carrier member have been filled with tufts of bristles, the carrier member is released from the drive of the filling station and transferred from the filling station to the conveyor during the time required for the filling tool to fill the brush body or brush bodies held on the following carrier member. The filling tool performs a continuous operation even during removal of each carrier member from the filling station and replacement by a following carrier member. Replacement of a carrier member in the filling station by the following carrier member can be done much faster than indexing of a turret. In addition, the carrier members with the brush bodies thereon can be moved much faster in the filling station to expose each hole to the filling member because the only mass to be moved is that of the carrier member and of the coupling means used to couple each carrier member to the drive of the filling station. During the filling of the brush body or brush bodies on the carrier member in the filling station, there is ample time to transfer a following carrier member from the conveyor to a position adjacent the carrier member currently coupled to the drive of the filling station, and ample time to remove the preceding carrier member with filled brush bodies thereon from the filling station to the conveyor. As a result, the overall operating speed of the machine can be increased beyond 1000 strokes per minute of the filling tool.

Another highly advantageous aspect of the invention is the fact that carrier members of similar uniform shape and size can be used for brush bodies of different types, shapes and/or size. In a conventional brush making machine with an indexing turret, when production is to be changed from one tooth brush model to another, the setup of the machine must be modified to adapt the clamping mechanism on the turret and possibly also the gripper for removing the brush bodies from the turret to the size and shape of the brush bodies to be processed. This setup is time-consuming and requires skilled personnel. In the method of the present invention, the carrier members are preferably provided as generally flat pallets of uniform

rectangular shape. Only the clamping mechanism on each pallet must be specific to the brush body model to be processed. Thus, when production is to be changed from one model from another, only the pallets have to be changed.

The present invention allows the filling station to be located closely adjacent the conveyor so that the filling station is just one among several processing stations arranged along the conveyor. The conveyor can be a closed loop chain conveyor, a carrousel type conveyor or of any other appropriate type.

The brush bodies are preferably supplied to the conveyor in a predetermined orientation, for example in a direction perpendicular to the direction of movement of the conveyor. Thus, when the brush bodies arrive at the filling station, they will be in the same relative orientation. It may, however, be desirable to change the orientation of the brush bodies with respect to the plane in which the filling tool supplies the anchor members usually used for securing implanted tufts of bristles in the respective holes of the brush body. If this plane is parallel to the longitudinal direction of the brush body, all anchor members are aligned in parallel rows. Alignment of the anchor members in parallel rows may cause the head of the brush bodies to crack along these rows. To avoid this, a further embodiment of the present invention allows the orientation of the brush bodies to be modified with respect to the carrier members whereon they are clamped. After fresh brush bodies have been supplied to the carrier members, they are pivoted by e.g. 30 or 45° while being held on the carrier members and moved to the filling station while being in this relative orientation to the carrier members. Relative orientation of the brush bodies with respect to the plane in which anchor members are implanted by the filling member will be changed in like manner. After the carrier members have been removed from the filling station, the brush bodies are pivoted on their carrier members in a reverse direction to be restored to the orientation in which they had been originally supplied to the conveyor.

Further features and advantages of the invention will result from the following detailed description of preferred embodiments with reference to the drawings, wherein:

Figure 1 is a schematic side view of a tooth brush making machine for performing the invention;

Figure 2 is a schematic perspective view of the drive in a filling station of the machine shown in Figure 1;

Figure 3a shows a pallet type carrier member with a pair of brush bodies clamped thereon in a predetermined first orientation and a plan view of a brush body head showing the alignment of anchor members in parallel rows; and

Figure 3b a similar view showing the brush bodies in a second orientation pivoted from the first orientation by a predetermined angle α.

The brush making machine schematically shown in Figure 1 is a tooth brush machine with a chain-type conveyor 10 and a number of processing or handling stations located along the conveyor 10. More specifically, a brush body supply station 12 where fresh brush bodies B are supplied to the conveyor 10 is followed by a filling station 14 where the brush bodies B are filled with tufts of bristles. The filling station 14 is in turn followed by a number of finishing stations including a trimming station 16 where the ends of the bristles are cut to the desired length, a rounding station 18 where the free ends of the trimmed bristles are rounded, a cleaning station 20 where the nearly finished brushes are cleaned and a stamping station 22 where the brush bodies are provided with the desired stamp. The stamping station 22 can be followed by a quality inspection station 24. The last station is a removal station 26 where finished tooth brushes are removed from the conveyor 10.

The finishing stations 16 to 24 can be conventional and will therefore not be disclosed in further detail.

The conveyor 10 of the tooth brush machine is adapted to transport pairs of brush bodies B on generally flat pallets 30 of rectangular or square shape. Each pallet 30 is releasably linked to the conveyor 10 and has a pair of brush clamps 32 for holding a pair of brush bodies B in mutually parallel relationship, preferably perpendicular to the direction of movement of the conveyor 10, as shown in Figure 3a. After a pair of fresh brush bodies B have been received and are safely held on a pallet 30 by the brush clamps 32, the pallet 30 is moved by the conveyor 10 to the filling station 14. More particularly, each pallet 30 is transferred from the conveyor 10 to a position closely adjacent a preceding pallet which is currently received in the filling station 14. As shown in dashed lines in Figure 2, a following pallet 30a is transferred from the conveyor to a position closely adjacent a preceding pallet 30b currently received in the filling station 14. In the filling station 14, the pallet 30b with the brush bodies B clamped thereon is releasably coupled to an x-drive block which is part of a cross-slide including a pair of lateral y-drive blocks 36 to impart mutually perpendicular movements in the directions x and y to the pallet 30b. By these mutually perpendicular movements, the pallet 30b is moved in front of a filling tool 40 to expose each hole in the heads of the brush

bodies B to a reciprocating filling member 42 of the filling tool 40. The filling tool 40 can be conventional and will not be disclosed in further detail. When a tuft of bristles has been implanted in each hole of the brush bodies B, the pallet 30b is released from the x-drive block 34 and removed from the filling station 14, and the following pallet 30a is moved to the filling station 14 and coupled to the x-drive block 34. Replacement of a pallet in the filling station 14 occurs during the time of a single stroke of the filling member 42 of the filling tool 40. In fact, operation of the filling tool is continuous and must not even be slowed down during the time required for replacement of a pallet in the filling station 14. After the last hole of a pair of brush bodies on a pallet 30 has been filled, the filling member 42 will retract in preparation of a new operating stroke, and when the filling member 42 is again extended to perform the next operating stroke, the first hole of a fresh brush body on the following pallet will have been placed in front of it.

During the time of filling a pair of brush bodies with tufts of bristles in the filling station 14, there is ample time to move a following pallet 30 to a position adjacent the pallet currently received in the filling station 14, and to transfer the preceding pallet 30 with filled brush bodies thereon to the conveyor 10 where the pallet is again linked to the conveyor chain.

Although all pallets 30 are of similar shape and dimension, the brush clamps 32 can be different as required by a particular tooth brush model. Depending on the particular tooth brush model, it may be required to move the pallets 30 in the filling station 14 along more than two axes. In these cases, other types of drives than those shown in Figure 2 may be more appropriate.

It is convenient to supply fresh brush bodies B in a direction perpendicular to the direction of movement of the conveyor 10 in the supply station 12. Thus, the brush bodies B will originally be received on the pallets 30 in the position shown in Figure 3a. If the orientation of the brush bodies B on the pallet 30 remains unchanged in the filling station 14, the flat metallic anchor members implanted by the filling member 42 in each hole in conventional manner will be aligned in parellel rows as also shown in Figure 3a. Alignment of the anchor members in parallel rows may cause the head portion of the brush body B to crack. To avoid this, the brush clamps 32 are preferably mounted on the pallets 30 to be pivotable so that the brush bodies B can be pivoted by an angle α with respect to their orientation in which they are originally received on the pallet 30. This is shown in Figure 3b. Figure 2 shows the brush bodies B on the pallet 30 with a similar orientation. As the filling tool 40 remains in the same position, the plane in which the flat anchor members are supplied by the filling member 42 will have been rotated by an angle α with respect to the longitudinal direction of the brush bodies B, as also shown in Figure 3b. Thus, the anchor members are no more aligned in parellel rows, and cracking of the head portions of the brush bodies B is avoided. After the pallets 30 leave the filling station 14, the brush bodies B can be restored to their orientation shown in Figure 3a to facilitate the finishing operations carried out in the finishing stations 16 to 24.

Claims

1. A method of producing brushes, in particular toothbrushes, wherein brush bodies having holes for receiving tufts of bristles are supplied to a filling station where each brush body is moved to expose each of its holes to a filling tool which implants a tuft of bristles into each of said holes, whereafter the brush bodies are transferred to a conveyor to be moved between a plurality of processing stations provided along the conveyor,
characterized in that
a) a brush body supply station is provided along said conveyor upstream from said filling station and said processing stations;
b) said brush bodies are transferred between said stations while being held on a carrier member;
c) each carrier member is releasably coupled to a drive in said filling station to move said carrier member in a manner to successively expose each hole of the brushbody to said filling tool;
d) each of said carrier members is transferred from said conveyor to a position adjacent a preceding carrier member in said filling station during the time required for the filling tool to fill at least one brush body held on said preceding carrier member;
e) each of said carrier members is transferred from said filling station to said conveyor during the time required for the filling tool to fill at least one brush body held by a following carrier member; and
f) each carrier member is removed from said filling station and replaced by a following carrier member during continuous and at least substantially unretarded operation of said filling tool.

2. The method of claim 1, characterized in that said conveyor conveys said carrier members in a closed loop.

3. The method of claim 1 or 2, characterized in that carrier members of similar uniform shape and size are used for brush bodies which may be of different shape and/or size.

4. The method of any of claims 1 to 3, characterized in that at least two brush bodies are held on each carrier member.

5. The method of any of claims 1 to 4, characterized in that each brush body is held on each of said carrier members by clamp means allowing said brush body to be pivoted relative to said carrier member.

6. The method of claim 5, characterized in that said brush bodies are supplied to each carrier member in a predetermined first position relative to said carrier member, pivoted to a predetermined second position relative to said carrier member before or during transfer of said carrier member from said supply station to said filling station and repositioned to said first position after removal from said filling station.

7. The method of any of claims 1 to 6, wherein said filling tool has a reciprocating filling member which performs one stroke for each tuft of bristles to be implanted in said brush body, characterized in that said filling tool is operated at a speed in excess of 1000 strokes per minute.

8. The method of any of claims 1 to 7, characterized in that said carrier member is a generally flat pallet of rectangular shape.

9. The method of any of claims 1 to 8, characterized in that the filling station is located closely adjacent said conveyor.

Fig.1

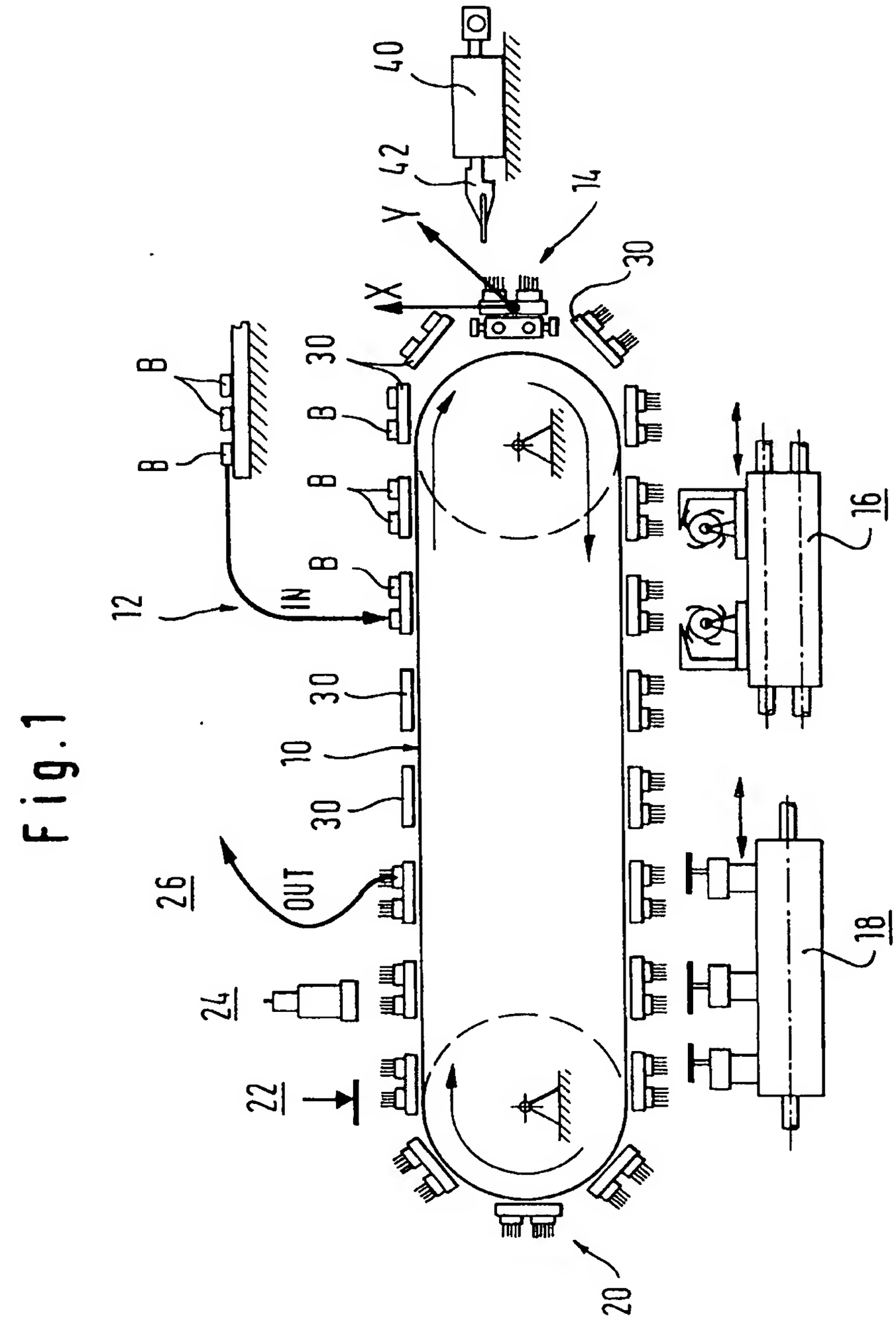


Fig. 2

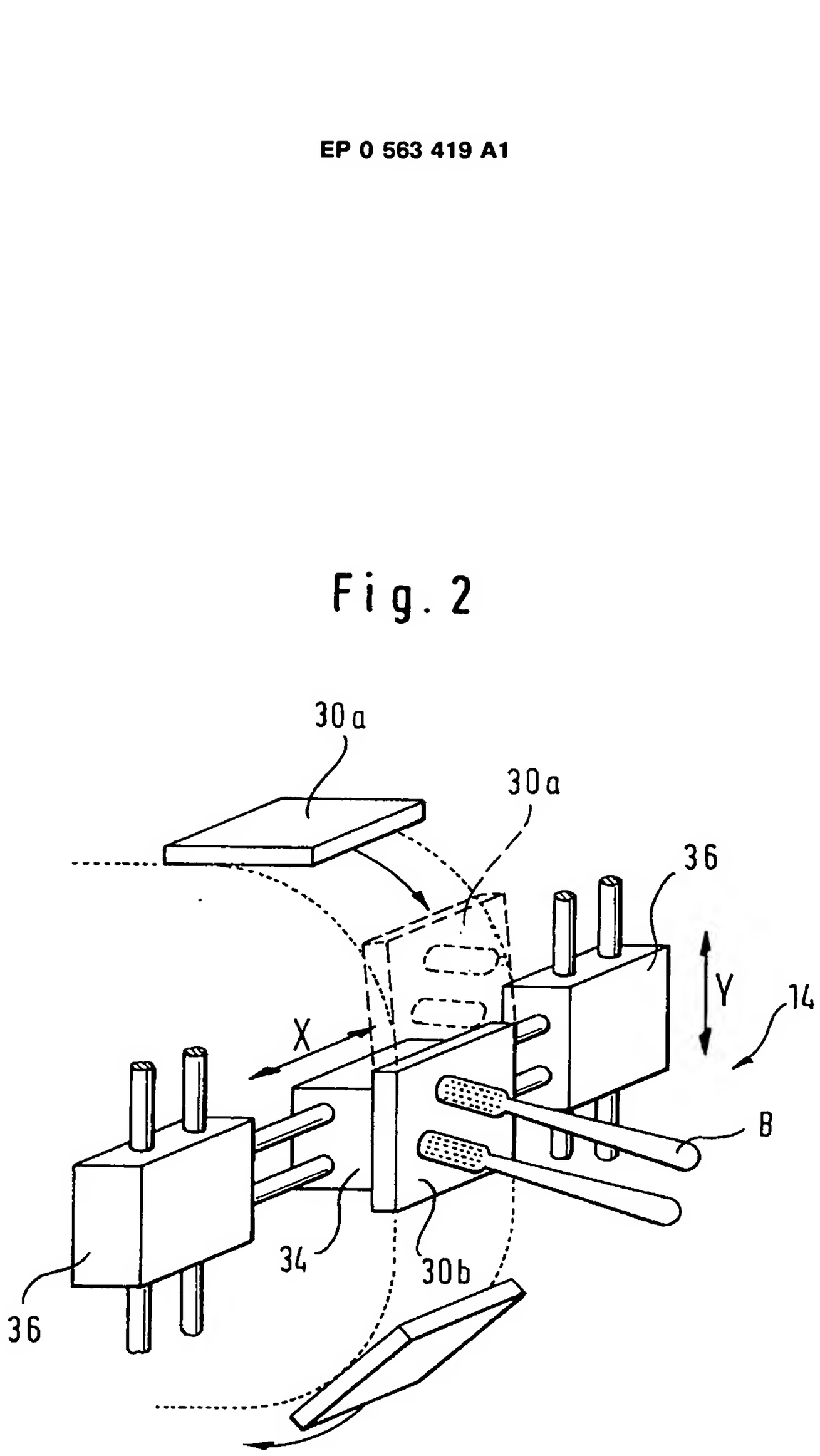


Fig. 3a

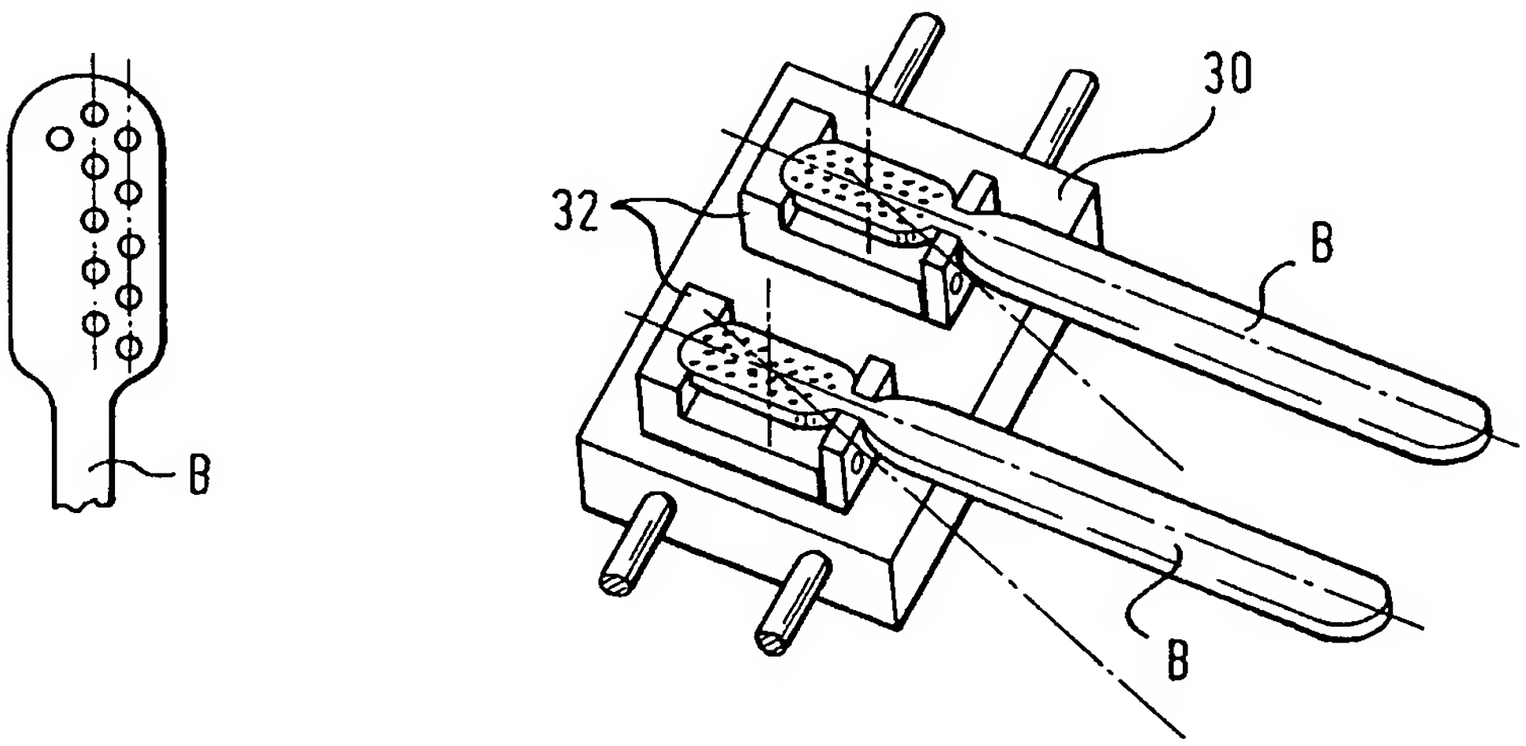
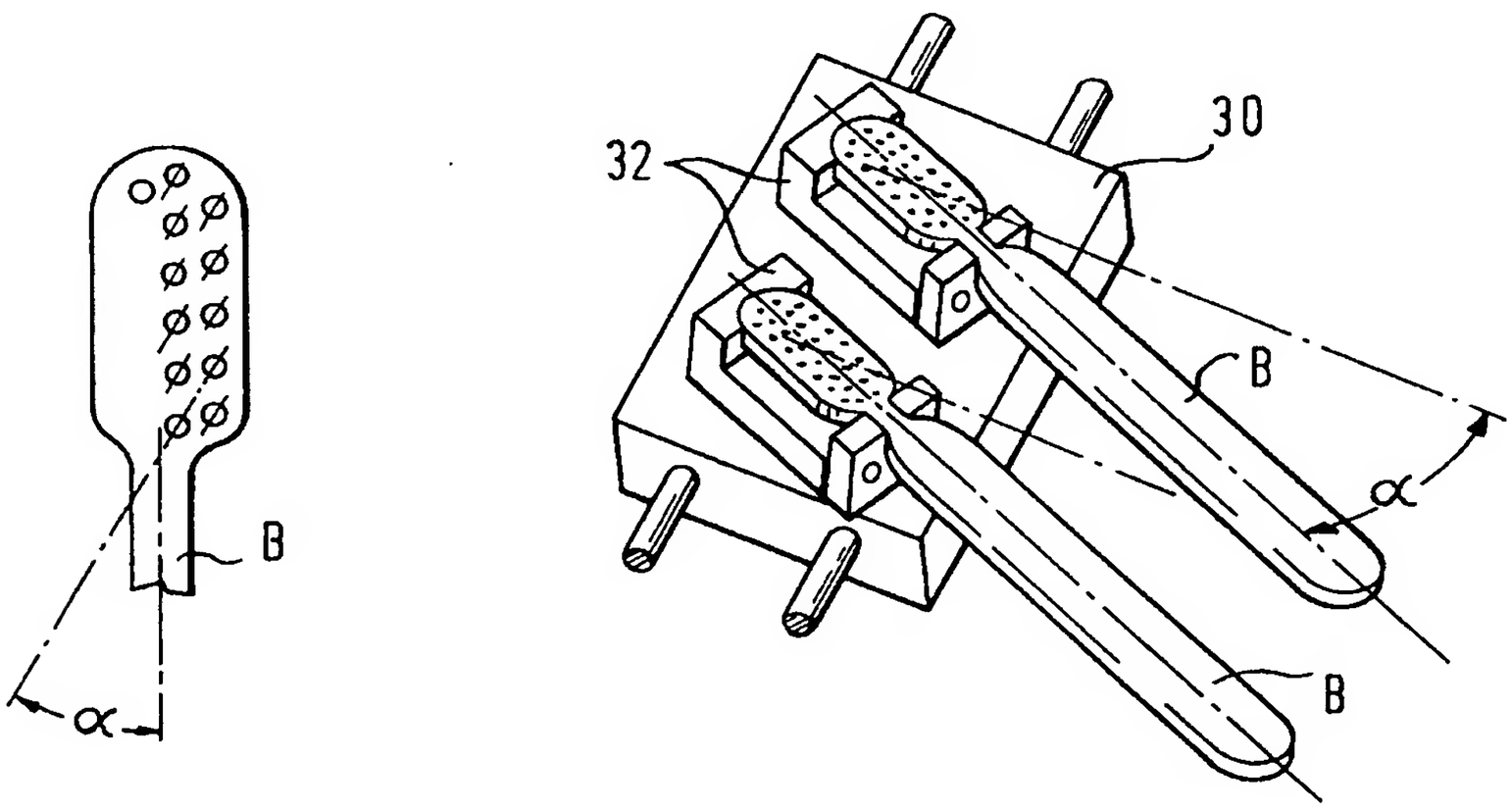


Fig. 3b



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EUROPEAN SEARCH REPORT

Application Number

EP 92 10 5528

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-1 498 457 (UNIVERSE MACHINE CO.) * page 1, line 22 - line 40 * * page 2, line 121 - page 5, line 55; figures *	1	A46D3/08 B23Q7/00
A	DE-A-2 659 458 (FA. ANTON ZAHORANSKY) * page 16, paragraph 2 - page 17, paragraph 3; figures *	1	
A	DE-A-2 731 762 (FA. ANTON ZAHORANSKY) * claims; figures *	1	
A	EP-A-0 195 134 (G.B.BOUCHERIE) * claims; figures *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A46D
B23Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 NOVEMBER 1992	ERNST R.T.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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